We proceed now Gentlemen to enquire into the phanon : ma and causes of animal Heat. In doing so I shall just mention the phanomina of animal heat as they occur in the human body, and then mention the disposent courses to which it has been werebed, I It is the same in all climates and seasons, this has been proved by many experiments. Its medium temperature in the human body is go, it is from 100, to 103 in certain domestic an : imals, as in the ox and sheep, and it from 103 to 109 in certain buds, so uniform is the heat of the hu man body in all climates, that Dr Lining tells us while the Meeting rose to 120° in S. Barolina, it fell to 97 when breathed upon or placed in the arm puts, In the west Indes I me tettrick says the heat of the human body rides to 100, but this is probably from a feverishness excited in the system by the heat of the Sun, or this extra heat may have been confined only to the skin this equable temprature of the body is said to characterize of animal life, 2 It is nearly the Same in all ages, in young children it is sometime a grade or two there what it is in adult life, and

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hence they are less affected with the cold than perto in Middle life; There is some thing analogous to this in other animals; the ova of insects resist cold more than the insects themselves, and an insect in its Chysolis more than in its perfect state; The heat of the body in old age is less than in early and adult life. 3. It is the same in both sepes under equal cucumstances His true men resist cold better than women, but this is owing to the powers which produce heat in the male acting with more force than in the female sep. 4th It is rearly the same in every part of the body when it is in a healthy state; It is one degree greater in the lungs and near the heart, than in other parts of the body. Mr Hunter Experements show it to be as follows in different points of the body. On the Skin 97.8, under the tongue gy, in the arethra, one inch, 92°, - In the rectum 93/2. Schwenke says it is less in the blood in The veins, than in the cuteries; This if true, may be account ted for by a cause to be mentioned presently, It is more permanent and perhaps greater in the head. 5 It is the same in the soleds and fluids of the body 6" It is encreased by exercise, and the stemulating kassions of the mind.

the they was the market to the course there with or the delay of the first of the state of the state of th and the state of t from the a de the separate the heart of the season tu to to the more force that in the formale days. 8th Ro the state of the s = 29 the 90. a secretarion of the second of the second of the second of of . me or the first of the second of the second of an inon the later of the first of the state of Th on lat He The saccording to I. Hounter, one degree lep in the sleeping than in the waking state; that according to Draarvin, one degree greater in the former, than in the latter state, both apertions may be true, In falling, askeep, we wake but denly with a sense of cold - but heat encreases with the pence we awake in the morning with a sense of warmth, and often with a mois ture from it upon on warmth, and often with a mois ture from it upon the skins. May not this cuesease of heat propibly, he owing to the disease of sleep. It is an have been mentioned cease to lake place, still is an have been mentioned cease to lake place, still is an

equally distributed upon the surface of the body, 2 in the visceice, 3 in the solids and fluids. 4th It is above the visceice of the below it.

I shall now enquire into the causes of the phanomina of animal heat which have been mentioned. I shall be gin by remarking that othere are several modes of exciting heat out of the body, are several modes of exciting heat out of the body. There are, lombustion, prefoure, friction, percurpion there are, lombustion, prefoure strokes, permentation whether by a single or succession strokes, permentation whether by a single or succession strokes, permentation and electricity, the three former, and perhaps the two and electricity, the three former, and perhaps the two latter, may all concern in the production of animal latter, may all concern in the production of animal leater,

Combustion was supposed for a long

= /4 the second will be seen to the field the things age and has may be town by aller a work was lively a 6 = u que p of the stand since the second of the second water and a second se , de bu is the execute the ten the first of the first of the street m if it is below it of the after the the state of the state of an : The ca a feel and to the stand by the stand of the feel of The have her sombored in property throuten; her culting the re is the of a map a notice from stratus, deriverentiates be on a chetmeet, the wive former, and perhaps in the 1 within the concine of the production of land made abo at later that here had been a formal later to the

time to be occasioned by the descharge of a prince. : He balled thogeston, by means of the action of air upon it. This phlogroton is supposed to be the same in ale to dies, and transfemble from one body to another . - But the experiments of Lavoy : un, and of other french Chemists, have called in question the existence of this supposed principle of phlogiston. They day that the principle which pro , du cas bombustion does not reside in the buining body, but in the air which asts whom it, the air they say is a compound body was esting of 27 parts of a matter they call opygen, 72 of what they call arote. and one of carbonic acid. The opygen they say fur : Ther is a compound of pure an , and a substance they call colorie, that is the matter or principle of heat, These facts being admetted, combustion they say is occasioned in the following manner: the body to be inglamed, being just heated, the air rushes upon It and un der goes a decomposition, the pure air is absorbed by the burning body, and the lalorice is set at liberty, and hence the production of light and heat, the air which is uncoasumed, is hendered unfit

when is to recordinate by the desidency of a prince to all willed the with the see many to the cotten 94 on upon it This philogentie is so percent to be the 8 have in the today out time specific some one ta boly to another . And the reference it or warmy all no and of other french Chemists, have called in ch quatern the excetine of this supposed prisingle is Lu ablegaster. They say that the prince pie which are oh drees son had two does not in rede on the due werely today 1. but in the rie which out where it, the me they day are controvered programed it to be to the A. in the thing call oppose of or what they call drown Th and one of cartoine acid, he orgen in they may pring an ther is a con nound of me an , and a substance they per is alone, that is the maller or prince his of real, The then parts being a smilled combined that day is as ne a concit in the pollowing manner; The cody a = 10 is a same to seeing prest realed; The are restress upon 600 e ser ser segues a decemperation. The please air's for where we say the feeling had and the said will as to FLE it is her to me were the production of legate and heat 1 the wee which is wearened is headened buy to 6

to support fixe any longer. It even extinguishes flame, It is in this state called phlogisticated, or arotic air, Exactly the same process Do Black had supposed takes place in the production of animal heat, me all earry a few place about with us and the chimney which contains it is Leated the Dr supposes in the lungs. The Facts which support ohis openeon are as follows. 1. It The absolute recepety of air to support anemal life there is no cenemal in the world that he was without it, whether it except in the air - in the water - under The earth, - or upon the face of the south - Buds beather and best oney should supper from an inability to perform that function in Their rapid flight through The air, they are provided with cells, which seine as reservous, of an, and which probably may of: : for do them the ogygen which supports their heat, Even the bornes of beids contain air and possibly for the purpose that has been mentioned. Feshes respine air, by means of their gills. They sicken and die when deprived of A, Their air bladder may probably tupply for a while the

to mapper - her am course. If so a coprague but plan Exactly the same proch a made at in process the same a the production of heathers to the carry a few place when I will the the with the gr or new parties to contained it as dealed the Dr spoked in the tongs the Fresh which terfered - ne the penson on a police. " The last received a view to so your and a see the he sto The is to exemple in the cortex shot a seed without is early the or exist in The coin - in The constitue the the de contin, as exper the face of the sainte - The late : see let stay or outh in the from on in about the 100 form dot function to Their raped the stone The sees they are provided by the celles which was 1 is secretary of their and which pertailly may ofer In in the offen which tapped the heat, the our te some of fee to contain account and proposed a is the surprise that had been thereine he to g so fled he fore ince to meneral graderic according bec de ten an the when detruced is the there were ut. c alle the may proved by the line for a control to

want of external air, although the principal design of it, is to assist them in afternding and lescending in the water.

pills do not line without air; it is conveyed to them by me and of long tubes. called Machia or stig: mata extending from different parts of the body to some insects these tubes after from the poste nors, in others from the back and sides; if other tubes be stopped by me and of oil, the in sect dies from sufficient, that is from the want of air:

their communication with the air.

Inails die welhout die, when they retreat from the cold of winter, they cover their to dies with a slimy coat, to thin as to admit the rapage of air through it. If this coat by any accident become too thick to admit the air, they responste it in order to make a papage for it

The Foad which has been

found

warm in so be nat an interest the presence yn ces lea theels work a destribute of lungles Ho gilled its not live control ont wer, it is conveyed to 2 a del mate of tending from ty cent plant of the court te In some undesto these tubes are from the protect cu really in street from the back and order, of go tele tubes be support in means of orle, the con are good him wither organs , when have the The the wh want of an mound toperarie who into an enverticence pro of her commence aton coll the air 2 mo would die welk ook our welen toeg retreat prope · Mu He cold of wenter, Hay over then to has well the a showy coak to them as to a count to properly te me tour she it if the cent by any accorder. in essent to thee to to a dome to the account to for a discolle De ere order to moter a period for it in a in o the they which had been

found in the middle of the trunks of large trees, and in the centre y stones where it has existed for one or two centuries, it is generally supposed receives air enough to preserve its heat, through the pones of the trees, and the cavities of the Lastly, even whose wests which are destitute of lungs have a membranous tube running along their backs in which delatations and contractions may be distinctly deen, and to ohis tube the au has acceps. - Euvile in speaking of this cun ous contrivance days. "The blood not being able to go in search of air; the air goes in search of the blood. The heat in all these chapter of animals is different, in the fish it is but 2° above the temperature of the water in which they steem, the heat generated is generally in proportion to the size of their lungs and the quantity of air consumed in ohem, Ind. The Connection of the heat of the body with the ad: mission of air ente the lungs, has been inserved from the quantity of air consumed in respiration, said to be a gallon in a minute - that is, 14 lubic inches in each woheration, but according to Defurin, and De Menzies experiments 40. lubre inches, in a minute in a heat of 60. It is said to expand to 43 bube inches in the lungs.

sound in made of the turner of longe their dance in the 3 conta y strain it reserved for son less es a traches, il of bei reak through the power of the trees nad to care that of the les to aboutely and show ever to which can do tente of bungs have lue sombooned him turnery along weer book to which wataline and contractions may be delinetly deal and oth to me take the as has acrep. Tavas in theaters of this fu en in our continuence days "The About not being able to rth and proceed of our the one gives in a cel of the blood. fre The heat in all there despet of are made is different, in let to push to is but 2° a ton the temperation of the water in toa which they smow the heat generaled is generally enin toa the portion to the sure of their lange and the quantity boo es enduned a them; The Gonnection of the read of the let of with the out 4th in prior of our onto the lange had been in facuate prior is to proceed to by our more ad in suffered tree ou a :act de a galera la la men le - testes, 14 lucre : cohes au each western two , hat we conding to Do person, and by Then I we warmen to 40 luder meder in a minte boa : tice e want of the the in with to to provide to the trade under fai a ple herryd

3. The connection of the heat of the body with the admission of air into the lungs. has been admitted from animal heat. being in proportion to the quantity of air consumed in respiration, and to the relation of the size of the lungs to the size of the animals, It is 111 in buds, and they we know have larger langs in proportion than any other animals, animal heat is in a lower degree in fish. insects and septiles, than in man, and many other breathing animals, and they we know have very small lungs in proportion to their fixe, and con sume but little air in respiration, It is in a very low de gree in the toad, for which reason Me Twels informs us in his travels inte spain. That the spanish ladies sometimes carry toads in their bosoms in order to lessen the heat of their bodies in hot weather.

4th From the change which takes place in the air which is discharged from the lungs in expiration being ep: actly the same as that which is produced in the air after its is robbed of its caloric or matter of heat air after its is robbed of its caloric or matter of heat by the combustion of a piece of wood or any other by the combustion of a piece of wood or any other body: The air we expire is true wrote or phlogis tody: The air we expire is true wrote or phlogis ticated air, and not only extinguishes flame but is fatal to univoals that breathe it.

Ith From the arotic air which is

de a sur out to hange that her addressed for a aming the : de or estimation and to the delation of the 190 of the langer to the of the animals, will the bush and the act Bro the anemale aremal heat of a result degree on lle with content and expluded, other he washer that many 99 the beathing ansmite as a steep him was have being Ne the deapt in proper level to their chespions con dame Thi the first separation, the in a very love day see in the 7. would for which has son a the Troops In part at the Property of the formation de to spain that The Agenceth. lades nome himes carried lec parts on their loverent in reduce to before the heart of hand ab du of hard in her treath lithe of from the characteristic he had a lace me the our here 4 dicher of the finderes ways on expectation being ex in = My apter to in worked of the calone is matter of head in in combostation of a proce of the it or any star =ed 8 The are him by period to their wards on playing att air, and not to be the pushed plant that is al tat discovered that their it it the I the the wholes are which to the discharged from the lungs being less warm accor aing to Dr Grawford, than pure air which is taken ento the lungs. 6th From the arterial blood on which the opygen air fust acts, being warmer by one de gree and 1/2 according to Dr brawford. Than benous blood. according to Mr Stunters anatomical thermometer it was 99 in the right ventricle of the heart, and 97 in the left ventricle of a dog hung for the purpose of accertaining This fact by Mr Coleman. 7th From the sed lolor of the blood, this color we know is deined from oxygen in the bolcothar of bitriol, in red lead, and in hams preserved with salt petre, which salt abounds with ogygen. Now the red color of the blood is supposed to be decined in like manner from the action of air upon it in the lungs. It is certainly much nedder in the pulmonary been than in the pulmonary arte . my after the air has acted upon it and much hedder in an adult. Than in a factus which has never breath from the analogous effects of oxygen air upon a burning body, and upon the lings, the more of this air that can be applied to a burning body, the more vivid is the flame emitted by it, and

teloperate in from the he has feeled - to make the more is to the wind fork whom pure when in taken well di Even was as there blick or which it if if you and flech not wind wromen by one degree into accountant to the out to there sides the l. condest to the this in our lone out their marker where a the regat receive of the heart ex 9, hi the app ap atricke if a ring him of fait to purples of accortaining ber 1 8 when is in solar you blook, that it is me know in 10 were from orygin in the Pater Star of better in here w is one to the rand for seeved well sall getter her out will and tracks coupped fine the set colding the store of pr of patient to the downed on the increase from the andrease The a see se from all the after fine for the section when and the oce the partiment of her in the one the per treated at the The of the color wife was color to the extension of the superior the color was superior to the color was superior was superior to the color was superior lva and and the war to the first which the term there were on his cu were the survey of the first of the same in hea tas men to the state of the same of the 22 Court the and williams a country are by many were

the greater is its heat, in like manner the more of this air that is necessed into the lungs, the greater the generation of heat, and hence the encreased heat of the body on a fever, and after exercise, imple and beautiful as this theory appears to be. there are several soled objections to its being the sole or exclusive cause of animal heat. I shall brufly mention These objections, got the heat of the body has been observed to be the same When the admits con of our cute the lungs has been prevented by disease or apparent death, a case of The latter kind is mentioned by de Haln; a lare occurred in Philada on July 5th 1811, in a man, in whom There was a total extenction of life from drinking cold water when he was very warm, his whole head - hands, and trunk, were uncomonly now four hours after his respiration was destroyed by death. Dr Foderee in his medein legale" mentions a case in which the heat of the body continued four days after death had taken place, 2 nd The heat of a limb is sometimes encheated yter

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the operation for ansurem, whereby the passage of the bloto which has been supposed to convey the heat gen erated in the lungs, to every part of the body, is com - pletely obstructed. I witnefoed a remarkable case of this kind in June 1811. in ge Hosey, a patient of Do Physick. the heat was much greater in the limb on which the operation had been performed, than in its fellow, and it was so long before it was sofrible for the anastamozing refoels to supply the function of the large cutery that had resulty been tied up and divided, and that had just before conveyed a stream of blood to the limb. Task in this case whence did the limb recieve its extra quantity of heat, 3,0 The heat of the body is often independent of the prequency of the pulse, or the force, or the quantity of blood propelled ento every part of it, we observe the skin to be very hot when the pulse is at 40. and I think the hottest skin I ever felt was in a Sailor in the yellow fever, in whom the pulse was imperceptable at both, wrests 4th the heart of the body is dimensihed in old age

ar to which has been to the and in more the 5. th any he do seems 1811 in for the last in parament of the bree the contract of the first find more in the comment of -ues that the privation has been payoned have in yan far it the same the their that is the thing here. The had not his : tion The be offe no hea etu

and get ala reople whale and consume as much air as they did in early and middle life. 5. the Here is ownetimes a Happage of respection wellwart any demenution of heat. There we see children hold their breath in erying, and yet the heat of their bodies conten nes the same. The horse it is said in a race of 400 yards holds his breath, and yet the leat of his body to for from being lessened. is greatly encreased. He pants it is said only at the end of the race - and never in his course of there is often a partial and morbid sensa tion of heat in the extremetics, while the parts between Them and the lungs are cool, or cold, This could not be the care if the lungs were the only and exclusive some of the best of the body -I. The heat of the body is but one degree greater in The lungs, than in parts more remote from them. now. whe the lungs. the fece place in which the heat of the body was exclusively generated, it ought to be more than one de gree greater Than in the extrem & Cerlain aliments and drunks encrease the heat of the body, without acting in the mallest

-- po. the state of the least of the first of the state of the state of demanded of the plant of the pl has Nor property of the last of the contract of the same of the tai a wilder his health, and join to his had a his half of se. som derny afternat is greatly encioused the faint 10 to out out at the out of the hice were an eq. = dl his ourte of when is you a particul and method nearly car in " que 11.th cases of the met it on order. The hout is the hody or her house weeper greaters of o or an earlier the their here where I see that I so Ih at it the was exclusioned personally of eight 40 to theme one is not a properly the second to ma fu = for Consider a distance of wound provide you come the house cy e in the the think he tag in the /= = trou

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degree upon respiration, or enereasing the decom - position of air in the lungs. In Cerlain tours encrease the heat of the body. This has yten been experienced ofter the firing of counou. Now, in this care no additional decomposition of air takes place in the lungs, for there is no encrease of resperation. 10 the Light enereases the heat of the body. This is often experienced on a hot evening in dummer when can : des are suddenly brot inte a dark room. no one can suppose that in this case more air to be taken into the lungs, or a sudden decomposition of an encueased quantity of air to have taken place in them. 11. Certain passions encrease the heat of the body conthout the least influence upon resperation, or the decomposition of air in the lungs. I have attempted year after year to explain these facts to as to reconcile them to the theory of my illustrious master Dr Black, but I never have been fully faite; fud with the solutions of them. I am compelled there fore to reject the decomposition of air in the lungs as the exclusive cause of animal heat, and to call in addi toual cause for that purpose, which I shall now.

as were as on your residence with a second real said landon of reason and heavy is the first and heavy the state of the sta de a is your been expensed with the free to go one and of to day places on the standard and some and as and as the 200 askerthis. = cuj de extense on the forest wing in rain the file of the the see seather of the to with a lie to specie to comp are creptor to make the order more as to be taken bus Rin at the land of the soudden as comparison if the constant - wn wanted your towner taken stars on thouber ins com We continue has a constant the entry the continue Run 3. × dud i me attempted you a fac from the workland their ment por to have expected in the state of the state o is e 070 proe in the the other was y them I am commented a sign a class the decoposation y air in the sample while jot = (1

submit to your examination, I shall begin by delivering a few general propositions. 1 tall bodies contain a certain portion of caloue, or matter of heat in them. I are these bodies are so constituted as to emit heat from impres . Sions made upon them by means of freete on and per : cupron. This is aborous in a piece of cold iron in de The stroke of the hammer. It occurs lekewide in wood, the protracted frection upon which, not only elletts heat, but induced plane. It is thus the Indians in this Country Rendle their fires. It takes place even upon compress - word made upon air, and that to such a dagree we are instrument called the "phen matic brequet" as to include combostion in a substance known by the name of 3. Deffecent substances populs a deffecent degree of susceptabelity to impere plons, so that heat is elicited from them in a greater or les force and the heat is encreaded according to The greater or less dination of those imprepions. There facts being admitted, I preced to apply them by remarking. 1. That areamalyer matter in common with the substan = ces that have been mentioned woulding a quantity of Coloree, or matter of heaten it, which it emili

when the your examined them, while they do he will have er a per second of the m 40 and : tion in the spottering the transmission which will be to the midthe i en here I clare, It is the ne hideans in this way the ale office and . It takes prime home his on comments he to u fe ou in the help a compare from a day he has been die 5. He as oxione on a reside on less more a la la company and the company of the company in many the second of the second of the second of the second of · qu the state of the s of por And the second s The first the second Thems to had a transfer to the had to a william to be

in common with those substances, in consequences of imprepious made upon the body, and thus produces the level ation and other phenomena of animal heat In addition to the facts That have been mentioned of the production of heat from aliments, down ds, light, and the action of the papeous upon the body. I shall men tion two facts from D' Ceart. The hand of a man in good health was placed in a bason or water at the temperature of 50. while his hand was quiescent the heart of the water roke to 85. (That is, 9. but when he moved his hand and fungers in the water it some to 73. That is. 17). again he placed the hand in a boson of water at sy, in this situation he felled all its muscles by an act of the wile with out moving his hand. The water rose in this case 5. beyond its temperature in the quescent state. Here we see heat produced as in The preumatic bi "quet" by sample prefore. Who after the result of there experiments can tuphore animal leat to be the effect of resperation only, or the decome portion of air in The lungs.

It would Leem from all the facts that a portion of animal heat

les where the second was the second with the second wh the said when I december is a second with the de an bod and in the prince of the france of a long not health was absent to a water of rath as 1 of iti 2 m are to you the state of the same of the same ach = se thes or has no at temperature one the gravitist 3.00 me that he has been he is no the gracemanter he ter en 4 th and the state of the transfer of the state o tim end the part of them prove a second was the an

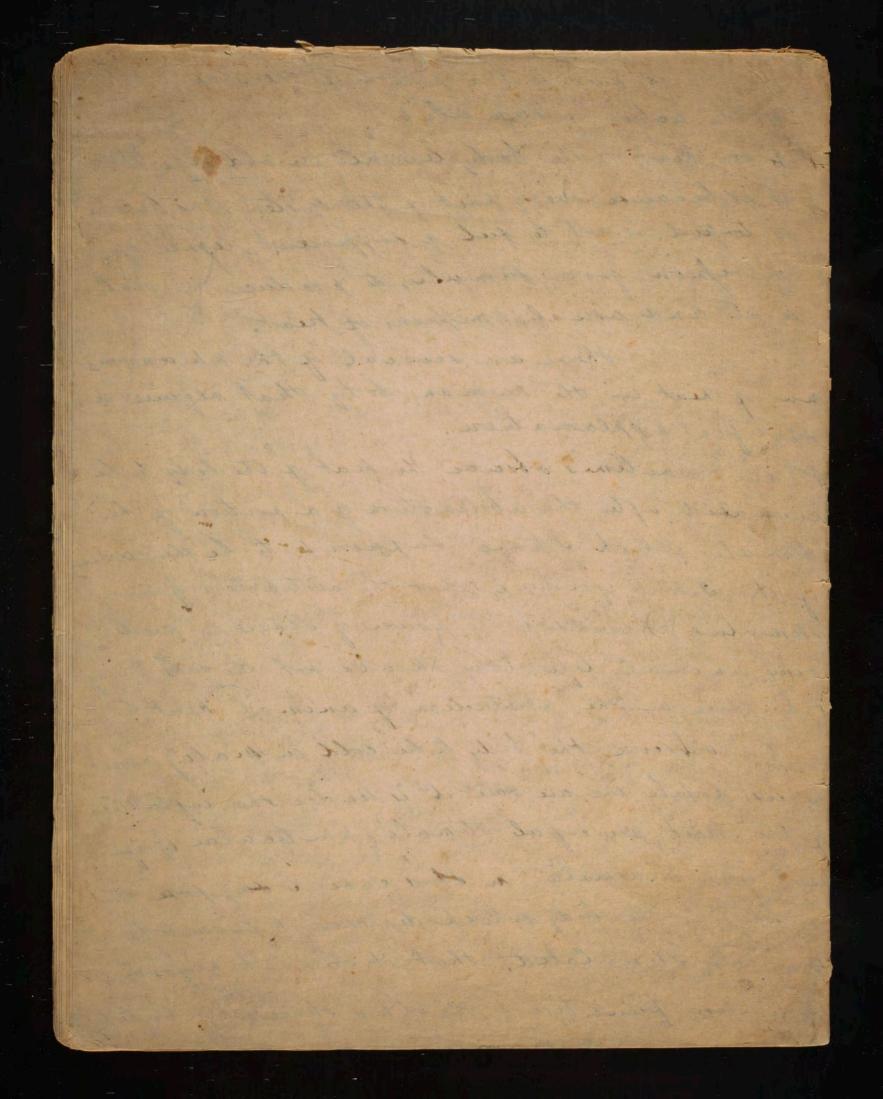
like animal life, is the product of Himuli acting upon different parts of the body. set us enquire how for the theory I have delivered accords with the phanomina of animal heat in the healthy and diseased body, and how it is applicable to the practice of physic, or the cure of diseases, 1st Is warm an a Stemulus. We find the heat of the external parts of the body encreased by its actions upon them 2 nd are aliments & drenks when taken cute the stone such of a stemulating nature! we distructly of serbe the heat of the body to be enceased by them. this is most observable after a full meal 3. Do Lounds, light, and odows, Stimulate the Hades, I we observe the heart of the body to be encreased by their action whom them. H' the certain exercises of the mind of a thimala ting nature? We find the heat of the body encreased by them, particularly by love, and anger, 5th are Frections upon the body of a Stimulating

who wasted the the the see Mo was referred to the the party ley 6th is a so query here for the thorough as du emined to hear the setting in the second de 7th a physical of the course of descenters, with ope if yourse a otmaker her part the hast ou. The wole and part of the bole Encourted on . S. th man my som is it dis cost to you steem in the wine of the detail the so he out the of the had an established the A The on seems at legal and a lease aller while the 9 da the seed to leave withour the that it it is the oth our sied of their action of the dance oh an the certain your is the mine a main te. andered the fear the least of the Kelly : cu is see by others for their land to the it ? oth 10t The street when the street were to see

nature? we find the heat of the body encualed by them like wite 6th Do bleeding purguey. womits, and low dut, lepen the heat of the body. they appear to de to. by the abstraction of timuli, The body become cool, and even cold, from the operation of fear. and greef upon it? May they not suppleant the action of the stimulating papions? . 8.th Is the heat of the body encreased by in certain directes, particularly fevers, this because news stimuli called unitants act upon it, or because men costomary stimuli aut with evereased force upon it from being rendered more excitable from The debelety which proceeded the fever. goth of the head usually warmen in diseases than other parts of the body? This is so much the case that it is seldom cold even in the chelly fit of on intermittent. The reason of this, may be owing to the stimuli which act whon the denses, produce ciny more emporemons upon the brain than upon other parts more semate from the Lendes. 10th for the heat of the body dimenshed in chronic descases? May not the Sentient extremities

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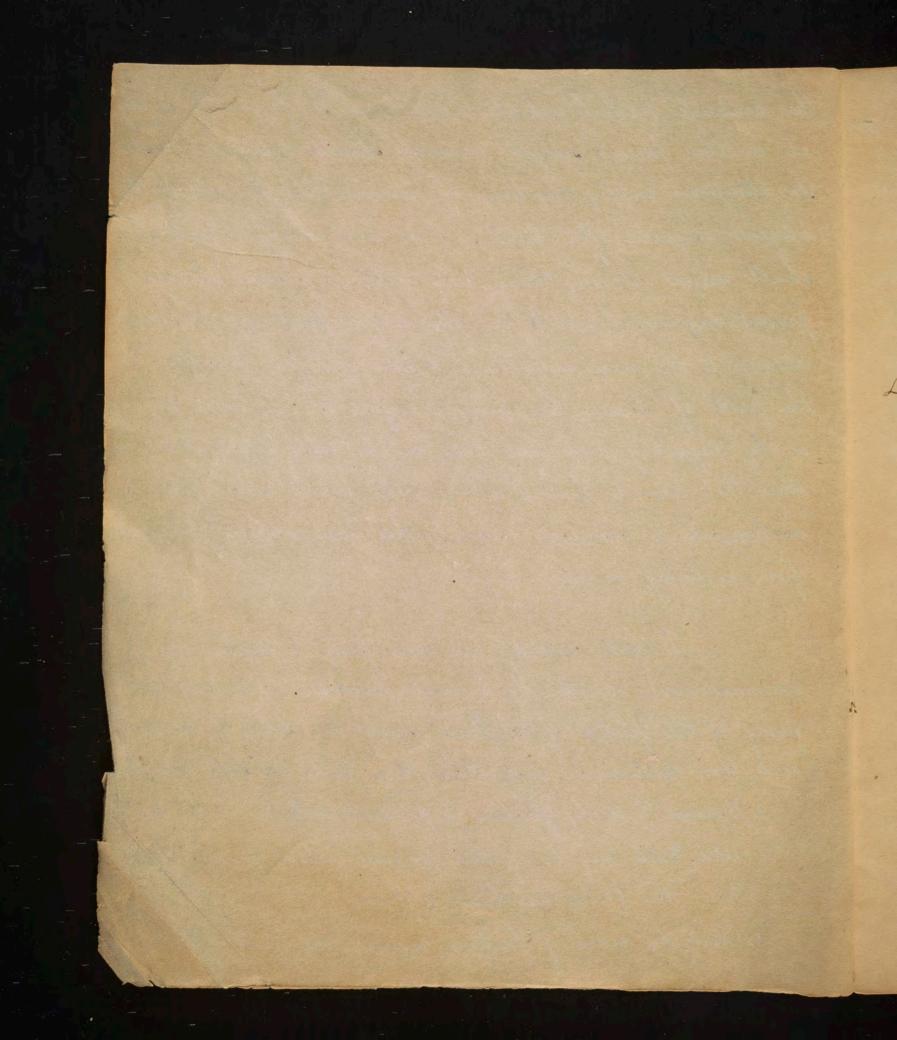
of the nerves have lost a portion of their denschilly to the action of them whi? Il & the heat of the body bepened in ald age! it is because every part of the system has become so torpid, as not to feel a sufficient degree of imprepeou from stemuli, to produce the nat : wat and usual emphous of heat. There are several of the phanome no of heat in the human body that require a specific explanation. got (we sometimes obscure the heat of the body to be everenced after the abstraction of a portion of the Stimuli which I have Supposed to be the cause of it. I said formerly that the abstraction of any Thoulus encreased the power of others in produc cury animal life, why should not the same theing take place in the production of animal heat? 200 lue observe the body to be cold on malequant peners. Colube we are sure it is under the influence of the most powerful stemuli, particularly of heat and measmata. In this cake I suppose that quality in the body which disposes it to emit-heat to be over stimulated, that it cannot resoon its ordinary functions, The other three altributes



the acuteness I talents which have been so frequently employ - Ed on the present subject, so much should remain to excite the attention, employ the time, or reward the labours of the deligant anguirer after truth. I do not imagine that I shall arrive at any thing very useful or certain in the present enquery. I hope to be able only to point out some new avenues to the more sulightened & better qualified traveller in the paths of Science that may be useful to him on his fourney; or by suggesting some new hints on this most important subject, show that animal heat is not entirely derived either from a mechanical or chemical source (as has been supposed) but y also from a living or vital origin.

It will certainly be unnecessary to make many animadversions on the mechanical bootrines. That heat is not owing to the "friction of the fluids against the solids of the body" or to their motion on each other, has been rendered improbable 1. Because heat by friction is produced only in bodies that are solid. Water may be agitated for ever without producing heat. Now the blood we know is fluid.

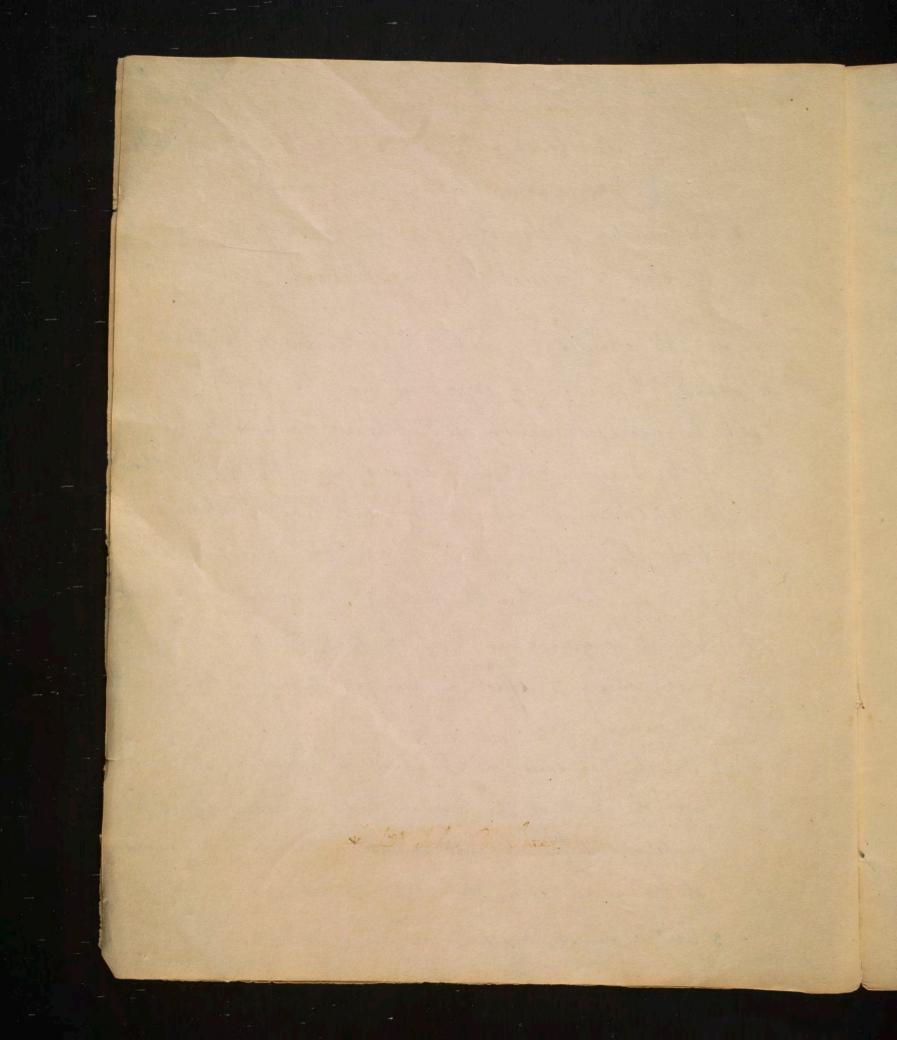
2. Heat by means of friction requires one of the bodies



3. The impetus of the blood in any part of the body is too slow to occasion heat by friction.

To the chamical theory & particularly to that of Lor brawford, the following objections may be urgad:

- I. An encreased action of the heart barteries, as well as of the Lungs, in particular diseases, frequently exists without any additional encrease of heat. Now in these cases, if the theory of Crawford be true, the encreased moment turn of blood thro' the Lungs, I the additional quantity of oxygenous air to which that fluid is exposed ought surely to effect a manifest change in the quantity of animal heat.
 - 2. In the two sexes, in Childhood, in adult life, I'm old age the heat of the human body is nearly equal, when material differences exist as well in the force I frequency of the pulse, as in the state of respiration.
- 3. Certain sounds, it is said, as well as certain aliments sucresse



the temperature of the body. But in these cases there is surely no additional decomposition of oxygenous air 4. The phanomenon of horse racing, to other similar instances in which there is a partial stoppage of respiration show no diminution in the heat of animal bodies. 5. Heat has been known to fluctuate in the body after apparent Death when the Lungs have been quescent for several days. 6. In morbid states of the system the extremities are frequently warmer than the Lungs, (which are considered the chimney of animal heat) a circumstance which ought, not to take place if the chemical theory were true. 7. I lastly, The passion of the mind have a wonderful influence over the heat of animal bodies - a circumstan -ce which is of the atmost importance in the consideration of the present subject; I which has certainly been too much neglected by modern physiologists.

Independently, however, of the objection to the theory of Dr. Erawford which have been stated, together with others which will be occasionally introduced in the course of these

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* Dr John Redman Coxe.

remarks, they will receive additional force from considering a fact mentioned by some modern chemists on the present sub -ject. From this it would appear that the oxygenous air taken into the dungs during inspiration answers the very important purpose of combining with the carbon given of from the Sungs, converting it into carbonic acid gas, & thus preventing & the fatal effects which would otherwise result from the brown -chial vefsels being cloged up by this accumulation of carbon. From this view of the subject it is plain to perceive that animal heat cannot be derived from the passage of an arisorm body to one in a flied state. On the contrary, Carbon (a soled substance) is converted into carbonic acid gas which would require an additional quantity of sensible caloric to be rendered latent to maintain it in its gaseous form; & should, if the principles of modern chemistry be true, produce the sansation of cold rather than that of heat.

The change of fluid blood into the solid muscular fibres bring one of the causes of animal heat, as taught by a very ingrnious & rulightened Chemist of the present Day, is equally unsatisfactory. True it is that when a fluid body

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changes into a solid state it generally gives out the calorie which maintained its fluidity. But the seisuce of modern Chemis -try teaches us to believe that, from the great rapidity with which calorie tends to an aquilibrium, this change, in order to produce sensible hear, must be sudden; whereas the formation of blood in the animal solids, in an ordinary state of health, is gradual & slow. By this theory we are likewise ignorant of the source from whence the blood itself derives it heat. And the production of cold when our fluid Lakes & Rivers be come solidified by the embrace of chilly winter must ever remain a forcible objection to the theory which has just been mentioned, during the present imperfect & fluctuating state of chemical Science.

As to the statement given by the same writer that the blood contains more latent heat than other fluids of the body, I that in its change to various secretions it renders sansible some of its latent caloric, is certainly a mere opinion which it would be unphilosophical to admit until some proofs are offered in its support.

Sufficient, however, it is hoped has been stated to show

that anin ph ou that our opinion of the mechanical & chemical theories of animal heat is not without foundation.

That animal heat is not altogether derived from a physical source, but, at least in part, from some other origin I shall ende avour to evince. But in order to concentrate our view of a subject so extensive as to embrace all animals. Land as well as aquatic, how various & even diversified sower their natures may be; It is proposed to divide the subject into the following heads: viz

I. Of animal heat & its distinguishing properties.

II. Of physical heat & its properties.

III. Of the connection between animal & physical heat.

IV. Of the effects of this connection.

V. Of the subjects of the operation of animal heat.

VI. Of hot blooded animals. +

VIII. Of cold blooded animals.

To enter into a full discussion of these particulars would for transcend the limits usually allowed for inaugural dissertations; - I certainly trespass too long upon the time I patience of the sulightened personages to whom this

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is submitted. We shall consequently very brieftly consider the separate articles in the order proposed. I

I. Of animal heat I its distinguishing properties.

Animal heat, we may remark, is inseparable from animal life, for where no life is there no animal heat can be said to exist. But as this heat is made manifest to sensation, it follows that it is a derivative from, & not the life itself; for life is evidenced by its qualities or adjuncts only.

That life is hot is manifest from its activity stime-ulating the affections, desire, & passions into fruition. I further, that such as the life is, such is the excitement & consequent action.

Without organization there can be no perfect Life, becousequently no animal heat. Now organization implies formative science, & hence arises a plain distinction between solar & animal heat.

The blush of shame excited into the human cheek; or the pallid hue of dismay; are Equal proofs

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of physical forms being under the control of a power very different from physical temperature as will presently be shown.

Nor can it be assented to that the colour of the blood is altogether owing to physical operation, no more than its quantity, composition, or consistence; for if it were, it does not appear why the colour of the blood in all animals should not be the same.

We do not well see how it can be denied that animal heat is prior & within physical heat when, in any given physical temperature, the passions of lust, anger, hatred or revenge can be excited into operation at the option of the will, altho' such passions were apparent - by quiet a few minutes before.

In short, without an active animal life & heat, animated being would be mere automata.

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III. Of physical heat & its properties. We know of no other source of physical heat to this our orb than the Sun, the centre of the plan - etary system. From him the revolving Earths derine the whole of their possessions. Like himself are his operations. He is present, by his rays of heat & light, in every part, as well as in the whole. But as he day not possess life, neither can he give it: he approaches not the higher limits of animati -ou. In this respect, his superior power at the Equator is equally impotent as his feeble rays at the poles. The general effects of heat, as Chemistry teaches, are expansion from centre to circumference, with elevation towards the centre by means of waparation. Heat combined with light gives colour according to the degree of mixture of each as is examplified in the flowers of the field, I in the grafs of the Earth, I in most natural objects. In a different degree of combination,

ofter to this min sale than the day will a like it the The state of the s

often the subject in which colour inheres.

Physical heat can be measured as to quantity, I ease quality, by proper instruments; - but we know of no instruments of whereby to ascertain the precise quantity or quality of animal heat.

We know that human bodies in health are commouly heated physically to about 96° of Farenheits ther mometer; but we are ignorant of any physical scale which shall give us the exact admeasurement of human passions - much less those of all animated nature.

Physical heat, like bodies of that class, is mere matter, I therefore subject to material Sais, wherein it differs from the appetites I passions of organized Sife.

Animal heat, it was shewn, is inseparable from organized dife; whereas solar heat is found in most substances, or ganized or not, either in a latent, or in a sensible or sensatory state, & is dead.

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This then constitutes a palpable difference between them

We have said (II) that animal heat, as being an immediate derivative of Life, is prior & within physical heat; It this is manifest by animal action bring an effect, and flowing into animal bodies from the internal, of their beings. Hence it would appear an inversion of nature to attrib ute to solar heat, which is manifestly external to us, the property of communicating that which is internal; It would be like putting the effect for the cause; or placing the cart before the horse.

III. Of the connection between physical fanimal heat.

Without an union of animal heat with solar influence there could be no animals in nature. For it would seem that the passions, appetites, and affections require what the painters express in regard to the fugitive colours of delicate vegetables. They want embodying".

To this union we are indebted for our knowledge

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of physiognomy; for our muscular power; for the lightning darting from the kye; & for many other things which we need not relate.

To this union, we imagine, the colour of the vital fluid, which circulates thro' our vefsels, & like a flowing tide, wasts to the extremest limits its purple riches, is altogether owing.

It is indeed true that the blood is poured into the right awricle & ventricle of the heart, dark; I even pushed into the Lungs from thence of the same hue; I that after it has received the pulmonary action it becomes florid; I is (thus changed) transmitted by the left ventricle to the general system; yet it does not evidently follow from hence that either its colour, or its animation, is derived from this source.

If it were derived from oscygen, that fluid must previous - by contain it; - (which we believe has no where been shewn) I that the animation, (if such, as we suppose, be allowed to it) we have attempted to shew before arise, from quite a different origin. -

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IV. Of the effects of this connection.

The effects of uniting animal heat with that of the Sun as mentioned above, (IIII) in organized bodies, is, embodying our affections & passions. This seems to be a primative or first effect, & from this all other effects in animaled nature, apparently arise.

Thus while this union lasts, the senses are active in degree, & life endures; - whereas disunion disholves the bodily bound & Elay-cold death ensues.

When parted, no solar influence, neither in quantity nor quality, can possibly restore the genial warmth which the living possessed but dust it is to dust it must return. The better part is gone, & left the dregs behind.

The blood, which in the living Man was supposed to owe its scarlet die to vital air, or to some material cause, now lies torpid in the veins in black clots, insensible & unmoved by surrounding

objects, altho' in the very midst of those to which its active powers were said to be owing.

But if our attempt (II) he correct, in ended -vouring to establish a distinction between animal & solar heat, then will the difficulty he solvable, & the knot untied; for as all heat is active, as well solar as animal, it follows that the central heat must be the most active of the two; - or must he is as master and servant.

If this should really be the case, then there is more reason to suppose the original colour of the blood to depend chieftly on animal heat I that it is modified by the heat I light of the atmosphere.

V. Of the subjects of the operation of animal heat.

coll organized beings are subjects of its operation, for as life is active, & action cannot exist without heat, it would seem evidently to follow that heat proxim-ately derived from life, must exist the organs into

th cl th h We find the chick in ovo is torpid without a determinate physical temperature, yet we cannot with any colour of truth say that solar or physical cheat that gives animation to it; nor are we to suppose that the crocodile or tortoise eggs are animated by a warm Sun, altho' deposited in a hot shore, whilst the prolific principle of either animal lodges within; but the contrary of this might, we imagine without much difficulty be maintained.

VI. Of warm blooded animals.

All animals on our globe which breather by means of Lungs only, are possessed, with trisling deviations, according to thermometrical measurement, of a degree of physical heat equal to about 96: The lowing herd in times of spring, - the servicion quadruped of the african

* The physical heat of birds is 111?

deserts, - I the feathered songster of the grove that charms by its melodious lay; - nay, all the orders and General of the classes Mammalia & does, according to Linnous are equal proofs of our assertion. -

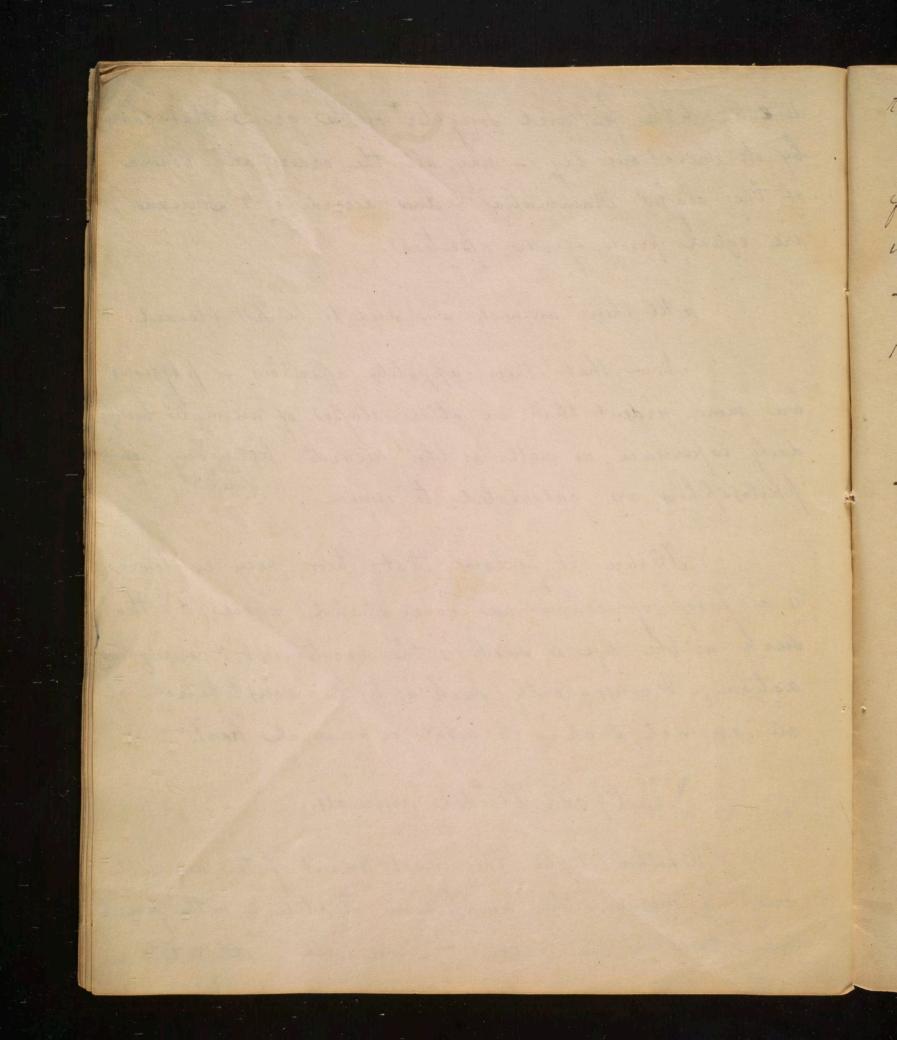
All there animals are said to be hot blooded.

Now that their appetites, affections, or passions are more ardent than in other classes of animated brings, daily experience as well as the recorded testimony of philosophers are calculated to evince.

Hence it follows, that there very existence is a proof of what we have stated above, (I) that such as the life is, such is the excitement & consequent action; - & consequently such as is the constitution of an animal, such is it's vital or animal heat.

VIII. Of cold blooded animals.

Whether it he the inject tenant of the air, - the creeping worm, - the amphibious Reptile, - or the fined inhabitant of the becau, they are all justly sutitled



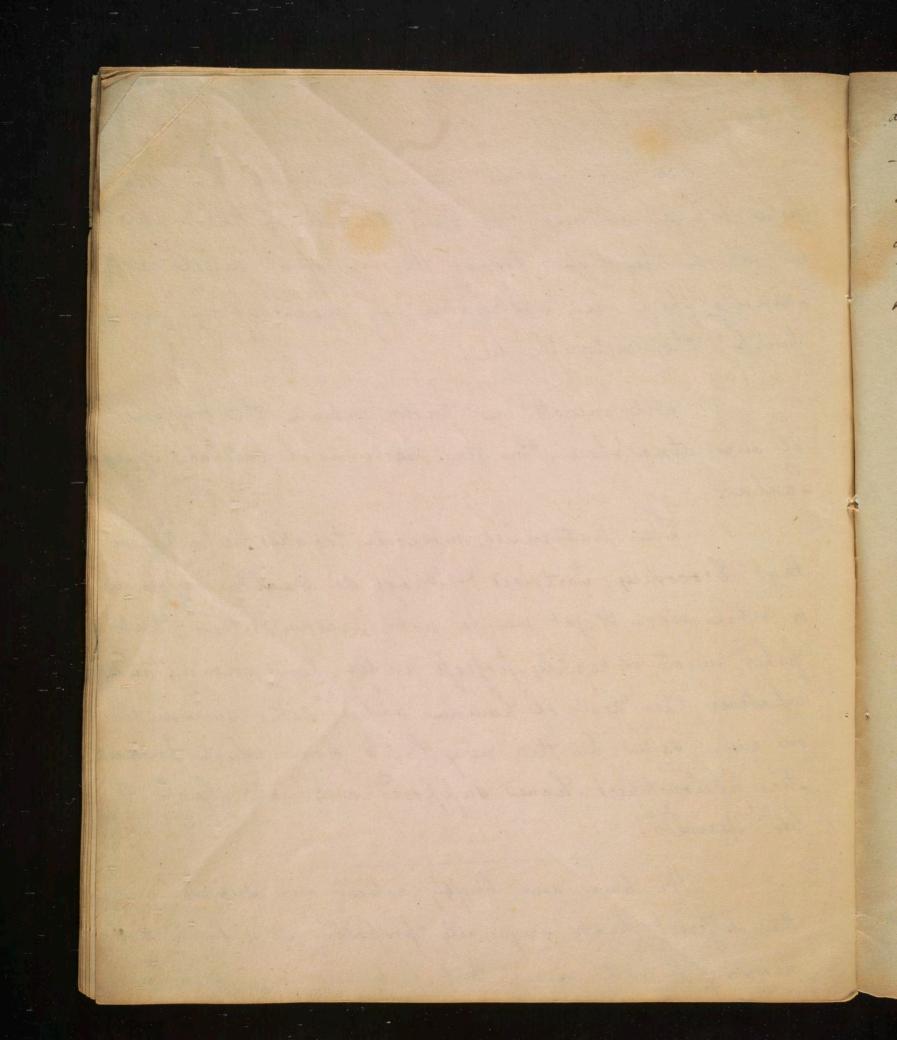
to this appellation.

It will not we imagine, he denied that all fishes inhale by means of Gills the air of the waters in which they live: for if the air of a nefsel cout - airing them he abstracted by means of an air pump, they instantly die.

of our atmosphere thro the medium of lateral spira-

The naturalist, moreover, teaches us to believe that Erocodiles, Tortoises, & Frogs do breather oxygenous or vital air; - & yet we do not perceive either that fishes, insects, or reptiles, possess, under any circumstances whatever the heat of human bodies; altho surrounded on every side by the very fluid from which preuma tic philosophers have supposed animal heat to be derived.

We have now bristely noticed our subject under the different heads originally proposed. It is surely not necessary to add more. But if it were admissible in

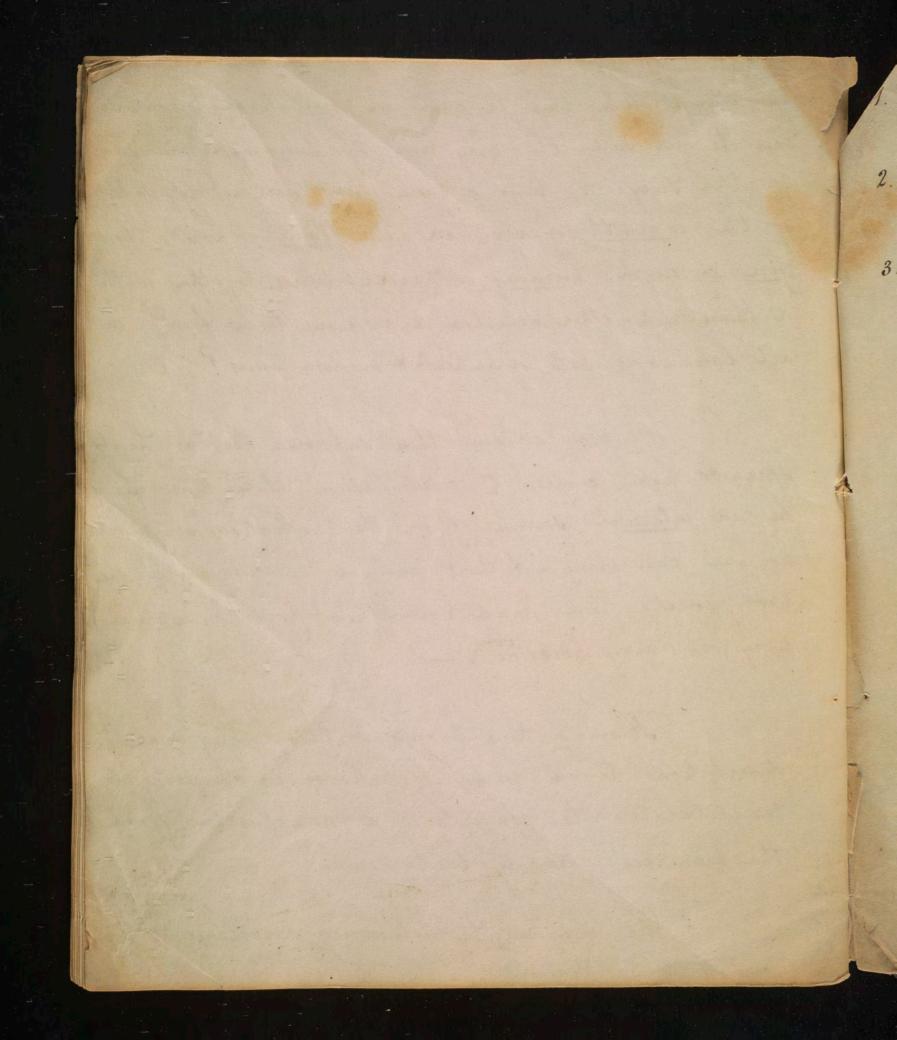


an attempt like this to call in collateral circumstant on the our aid, the very terms of Language are express on their subject. Who is there that does not speak of the warmth of affection; The flame of Love; the fire of anger; burning or heated desires; together with a hundred other similar expressions to be found in all languages both of anticul & modern times?

We may certainly then suppose that as hear spreads from centre to circumference, there must needs be an internal source of it. That affections are warm no one can deny; - I that animal hear, therefore, does not proceed from dead solar hear (which is external) wery one may perceive. —

Having thus brought this inaugural dissertation to an end, it behoves us concisely to recapitulate the contents as a conclusion from the premises already laid down.

Vor imagine the following corollaries may !!



1. That animal heat is not matter but independent 2. That solar heat is matter, & definable by material 3. That these two, by union, produce all the variety of existence we perceive throughout animated nature.

